

Pacific Northwest Weather Workshop

**Satellite Data Capabilities and Their Application
to Coastal and Marine Forecast Challenges**

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1 March 08



Presentation Outline

- **Role of HQ NWS Office of Science and Technology (OST); Office of Climate Weather and Water services (OCWWS)**
- **Environmental Satellites' Current Status**
- **Satellite Data – Being Put to Use**
- **The Future of Environmental Satellites**
 - NPOESS
 - GOES-R
- **Satellite Training Resources**
- **NWS Satellite Requirements and Solution Steering Team (SRSST)**



HQ NWS Role

- Office of Science and Technology (OS&T)
 - Systems, Science, Solutions
- Office of Climate Weather and Water services (OCWWS)
 - Requirements
- What We Do
 - Inform HQ NWS management of satellite issues
 - Ensure effective access/use of satellite data
- Mike Bonadonna (OS&T)
 - JARG rep
 - GORWG rep
 - W&W liaison to Satellite Subgoal
- Kevin Schrab
 - Observing System Requirements
- Bill Sjoberg
 - SUAG Exec Sec
 - Facilitates various satellite related activities



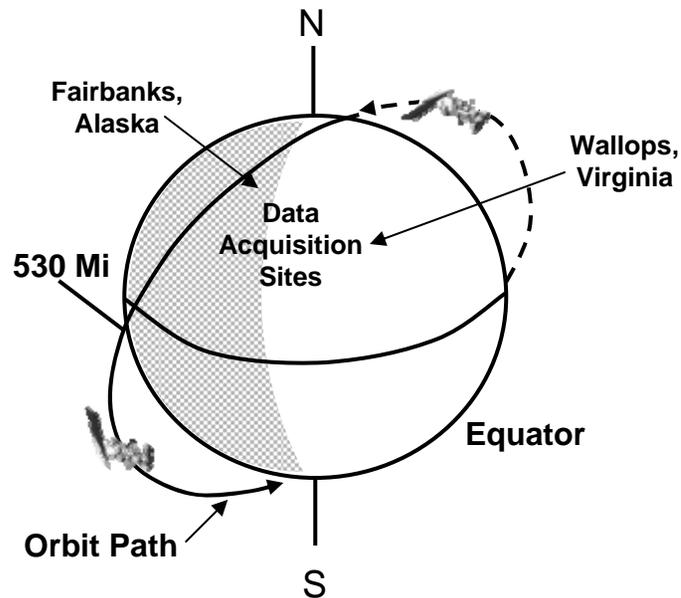
Environmental Satellites' Current Status



POES Constellation



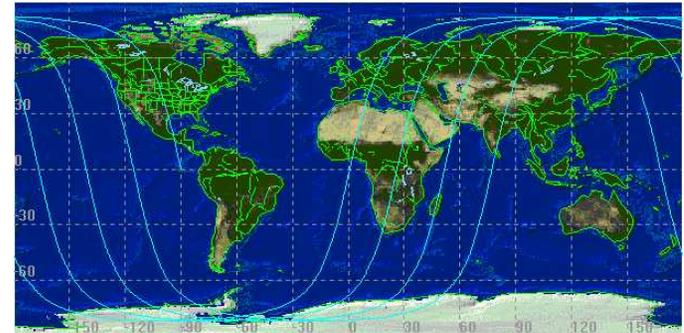
Polar Orbiting Satellites



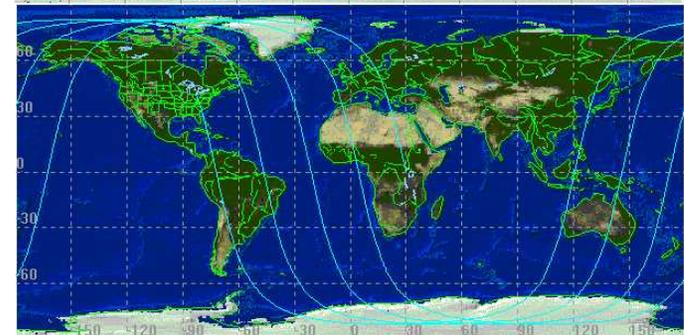
Each satellite covers the Earth twice per day

- Each orbit 102 minutes
- Global coverage every 12 hours with 1 satellite
- Images are global, includes the poles

2 P.M. Orbit for 6 hours



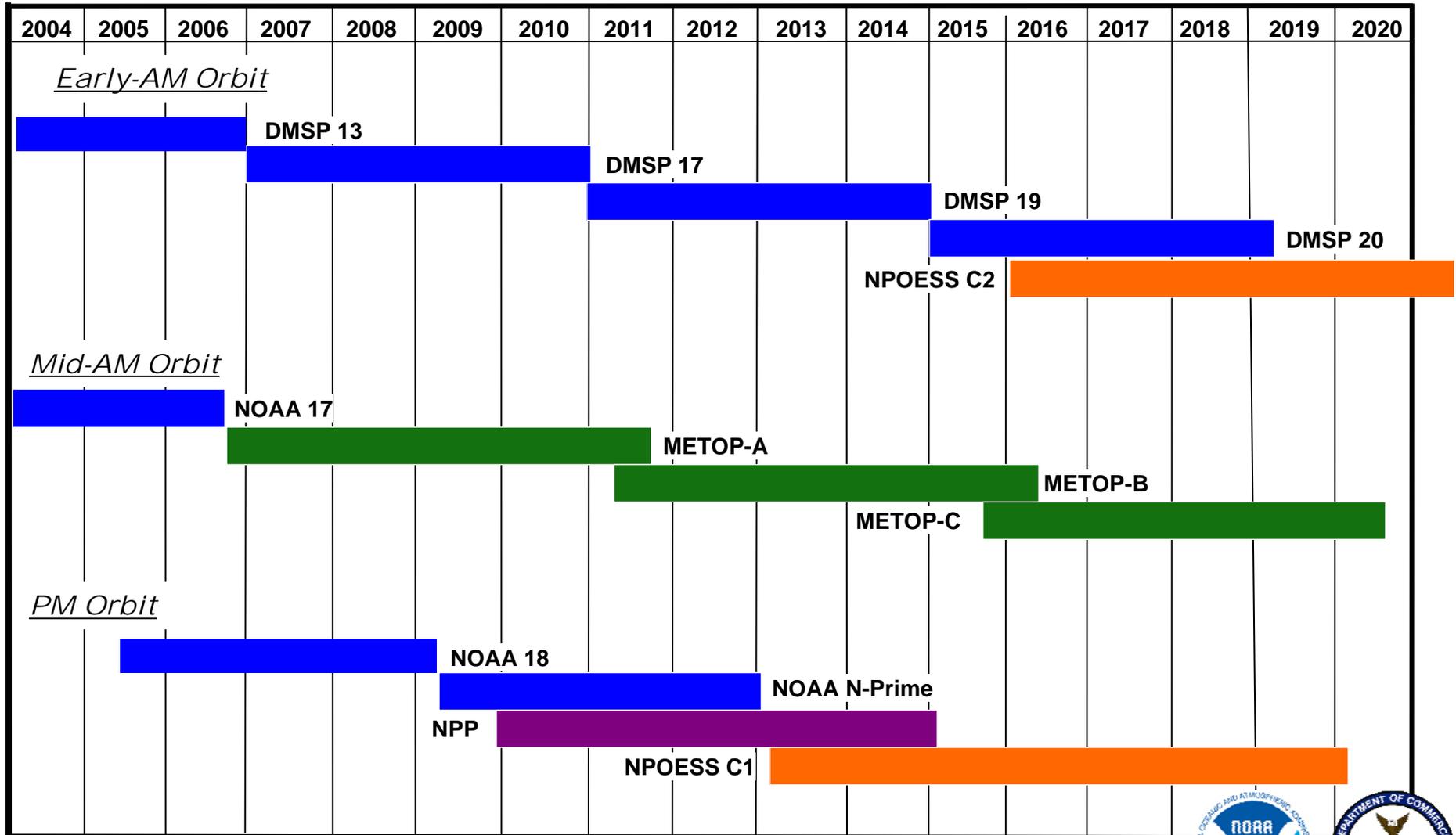
10 A.M. Orbit for 6 hours



- 2 polar operational satellites; one in morning and one in afternoon orbit, yielding 6-hour global sampling
 - NOAA-18 Primary afternoon satellite
 - MetOp-A Primary mid-morning satellite
- EUMETSAT in partnership for mid morning orbit after 2006
- Launch upon failure of imager or sounder
- Continuity of operations since early 1960s



NOAA Planned Missions - Polar



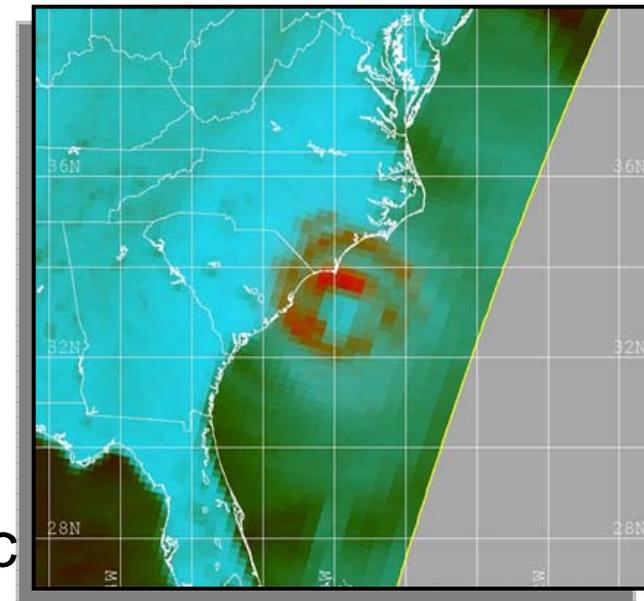


Polar Orbiting Satellites



NOAA Polar Orbiter

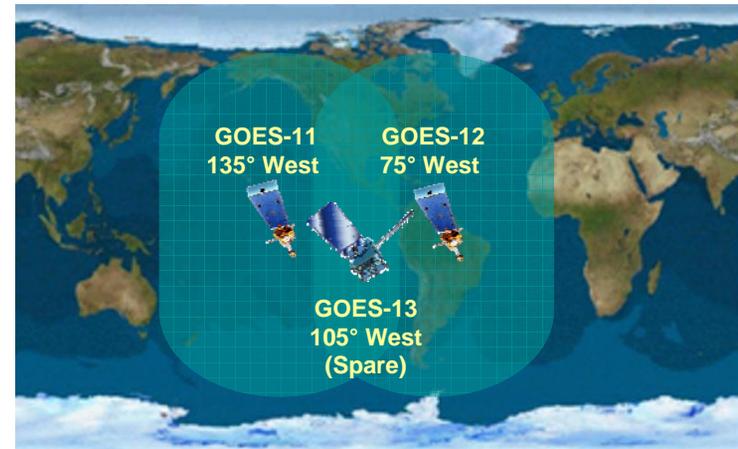
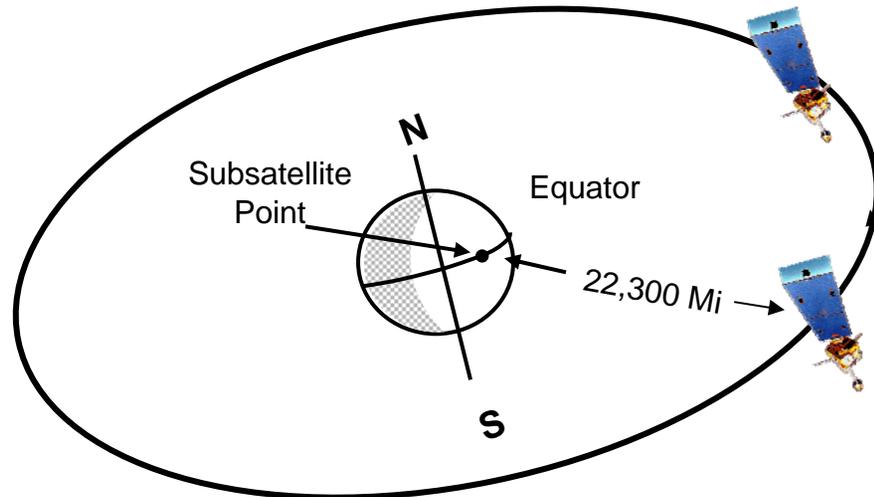
- AMSU (Advanced Microwave Sounding Unit)
- AVHRR (Advanced Very High Radiometer)
- HIRS (High Resolution Infrared Radiation Sounder)
- NWS obtains:
 - Precipitation estimates
 - Precipitation Intensity
 - Sea surface temperatures
 - Center position for tropical cyc
 - Convective structure
 - Atmospheric temperature/humidity profiles





GOES Constellation

Primary Requirement: Continuity of Capability



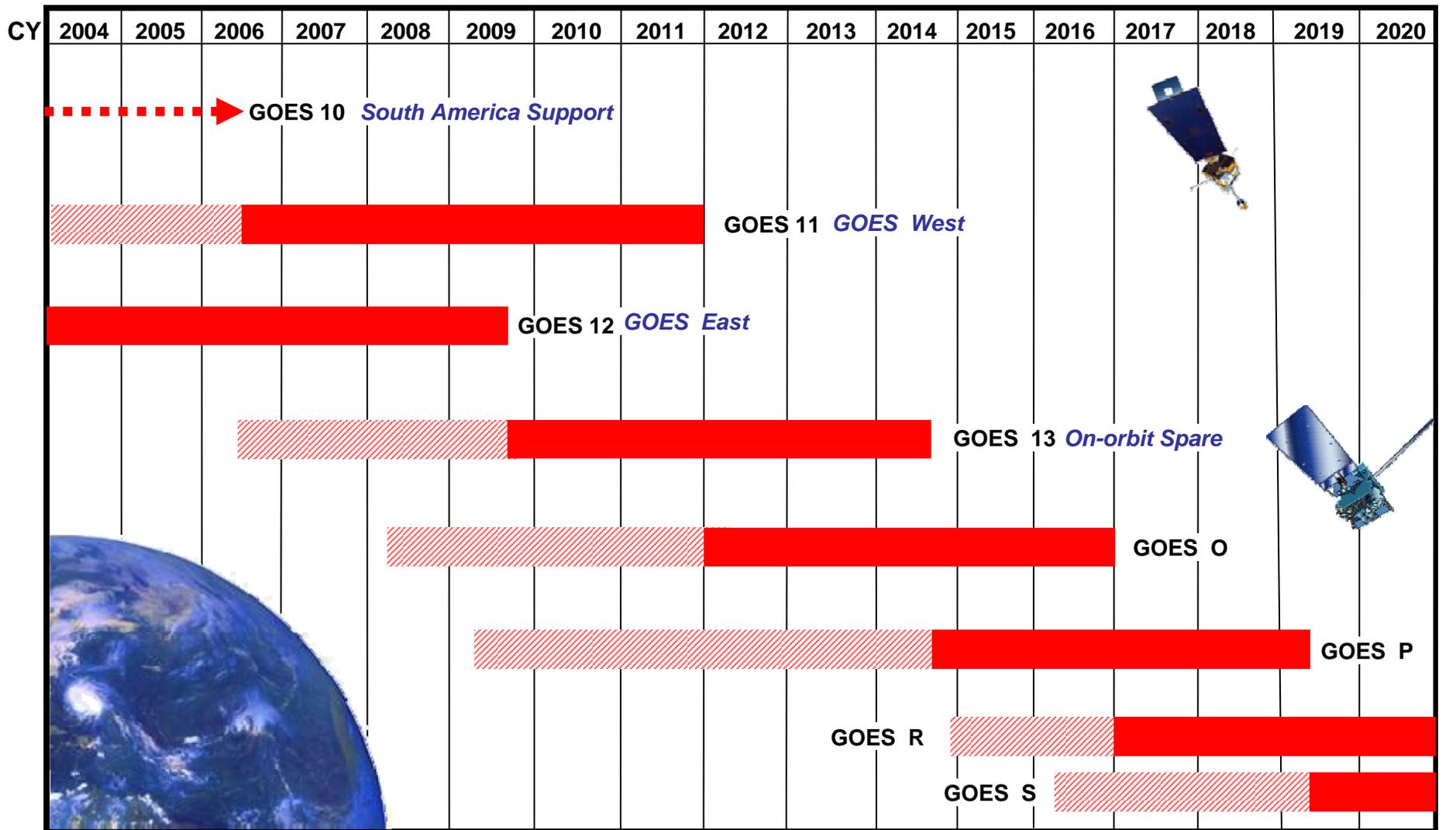
Two operational satellites and on-orbit spare

- **GOES I-M (8-12)* series operational since 1994**
 - GOES-10 operational at 60° W in support of South America beginning December 2, 2006
 - GOES-11 operational as GOES West beginning June 21, 2006
 - GOES-12 operational as GOES East beginning April 1, 2003
- **GOES N-P**
 - GOES-13 launched May 24, 2006, storage at 105° W, on-orbit spare as of January 5, 2007
 - GOES-O in ground storage
 - GOES-P in factory testing phase
- **GOES-R series will replace the GOES-N series no earlier than 2014**

* Note: Satellites are labeled with letters on the ground and changed to numbers on-orbit



Continuity of GOES Operational Satellite Program



- Satellite is operational beyond design life
- ▨ On-orbit GOES storage
- Operational



Satellite Data on AWIPS



GOES Products	POES Products	MODIS
GOES Imagery	Polar Imagery*	Color Composite (500m, 1km, 4km)*
GOES BUFR Soundings	POES BUFR Soundings	TPW (4 km)*
GOES Sounder Imagery	Blended Total Precip Water (TPW)	SST (4km and 1km)*
GOES High Density Winds	QuikSCAT Marine Sfc Winds	Cloud Mask (4km)*
GOES Lifted Index	Four Satellite Composite	LST (1km and 4km)*
GOES Precipitable Water	AMSU TPW	Lifted Index (4km)*
GOES Skin Temp	AMSU Rainfall Rate (RR)	Cloud Top Pressure (4 km)*
GOES Cloud Top Height	SSMI TPW	Cloud Phase Product (4 km)*
GOES Effective Cloud Amount	SSMI RR	False Color Composite (500m, 1km, 4km)*
GOES Aviation (Icing, Icing Height, Low Cloud Base, Fog Depth)		Fog Product/Diff. Channel 11-3.9 micron (1km, 4km)*

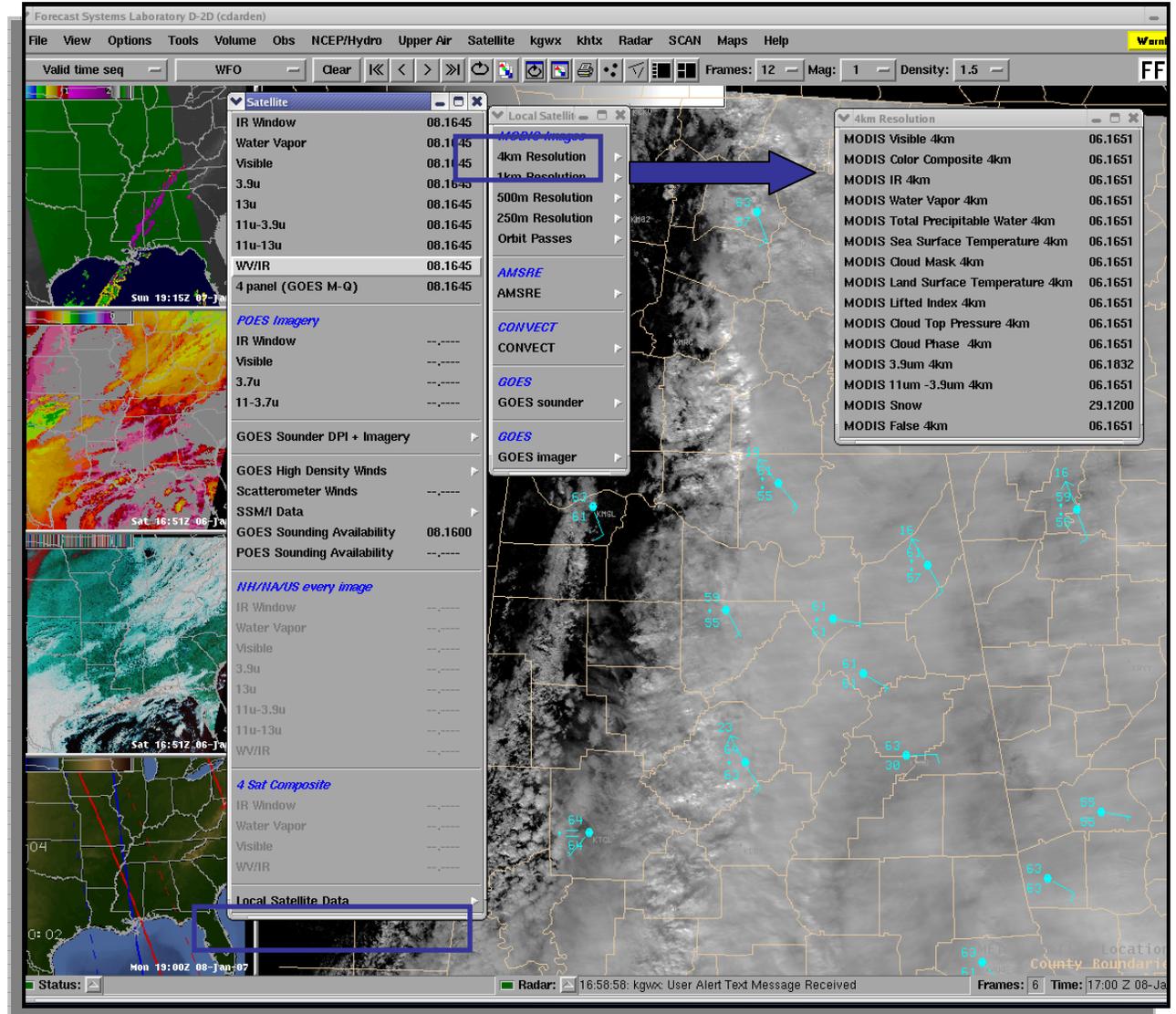
* Not in baseline AWIPS



MODIS Data Access in AWIPS

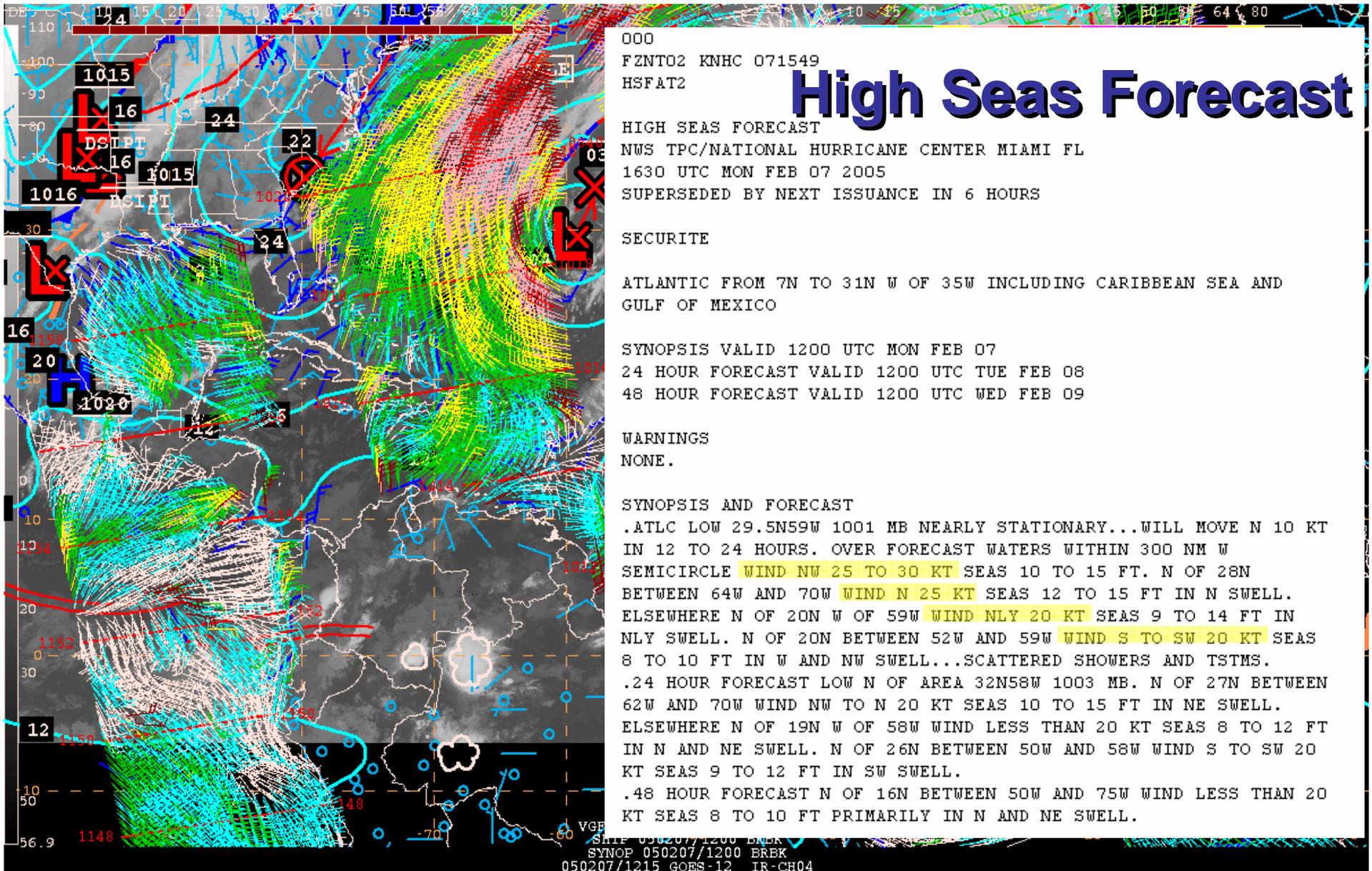


- MODIS data is provided at 4 different resolutions (4km, 1km, 500m, 250m) corresponding to CONUS, Regional, State, and WFO coverage areas
- Overlay, manipulate, and interact as with any other satellite data
- Orbital track maps show coverage of recent past and upcoming orbits
- (+/- 5 days)





Surface Analysis with QuikSCAT



000
 FZNT02 KNHC 071549
 HSFAT2

High Seas Forecast

HIGH SEAS FORECAST
 NWS TPC/NATIONAL HURRICANE CENTER MIAMI FL
 1630 UTC MON FEB 07 2005
 SUPERSEDED BY NEXT ISSUANCE IN 6 HOURS

SECURITE

ATLANTIC FROM 7N TO 31N W OF 35W INCLUDING CARIBBEAN SEA AND GULF OF MEXICO

SYNOPSIS VALID 1200 UTC MON FEB 07
 24 HOUR FORECAST VALID 1200 UTC TUE FEB 08
 48 HOUR FORECAST VALID 1200 UTC WED FEB 09

WARNINGS
 NONE.

SYNOPSIS AND FORECAST

.ATLC LOW 29.5N59W 1001 MB NEARLY STATIONARY...WILL MOVE N 10 KT IN 12 TO 24 HOURS. OVER FORECAST WATERS WITHIN 300 NM W SEMICIRCLE WIND NW 25 TO 30 KT SEAS 10 TO 15 FT. N OF 28N BETWEEN 64W AND 70W WIND N 25 KT SEAS 12 TO 15 FT IN N SWELL. ELSEWHERE N OF 20N W OF 59W WIND NLY 20 KT SEAS 9 TO 14 FT IN NLY SWELL. N OF 20N BETWEEN 52W AND 59W WIND S TO SW 20 KT SEAS 8 TO 10 FT IN W AND NW SWELL...SCATTERED SHOWERS AND TSTMS.
 .24 HOUR FORECAST LOW N OF AREA 32N58W 1003 MB. N OF 27N BETWEEN 62W AND 70W WIND NW TO N 20 KT SEAS 10 TO 15 FT IN NE SWELL. ELSEWHERE N OF 19N W OF 58W WIND LESS THAN 20 KT SEAS 8 TO 12 FT IN N AND NE SWELL. N OF 26N BETWEEN 50W AND 58W WIND S TO SW 20 KT SEAS 9 TO 12 FT IN SW SWELL.
 .48 HOUR FORECAST N OF 16N BETWEEN 50W AND 75W WIND LESS THAN 20 KT SEAS 8 TO 10 FT PRIMARILY IN N AND NE SWELL.

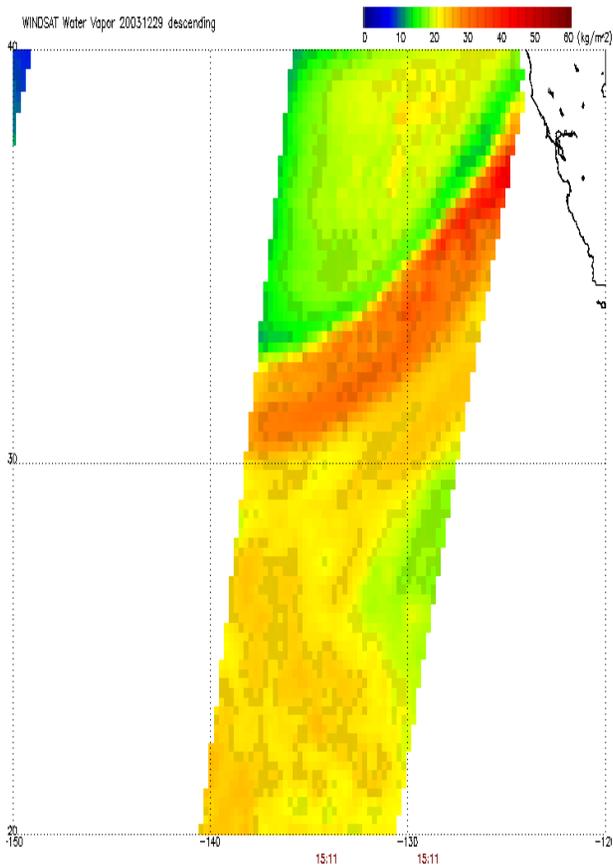
VGFF
 SATE 050207/1200 BREK
 SYNOP 050207/1200 BREK
 050207/1215 GOES-12 IR-CH04



Satellites Tell a More Complete Story



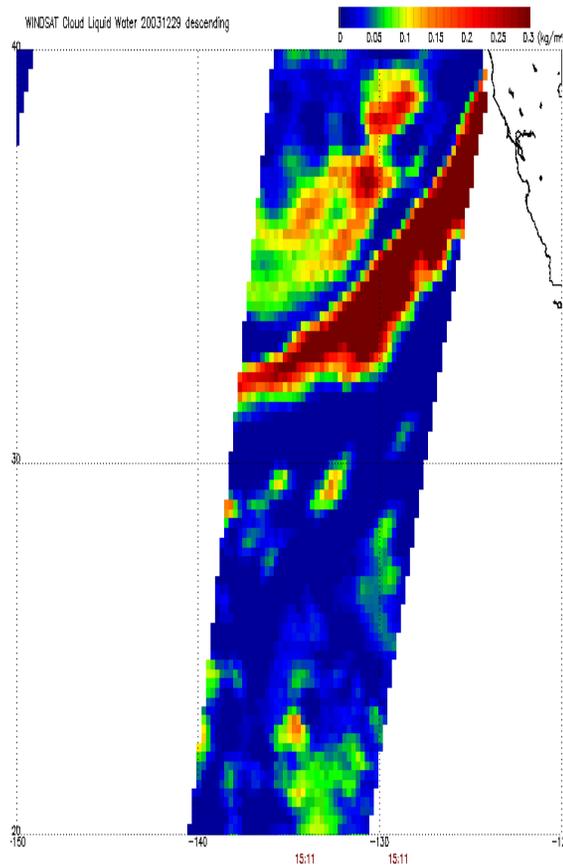
Total Precipitable Water



Note: 1) Times are GMT 2) Times correspond to 30N at right swath edge - time is right swath for overlapping swaths at 30N
3) Data buffer is 24 hrs for 20031229

NOAA/NESDIS/Office of Research and Applications

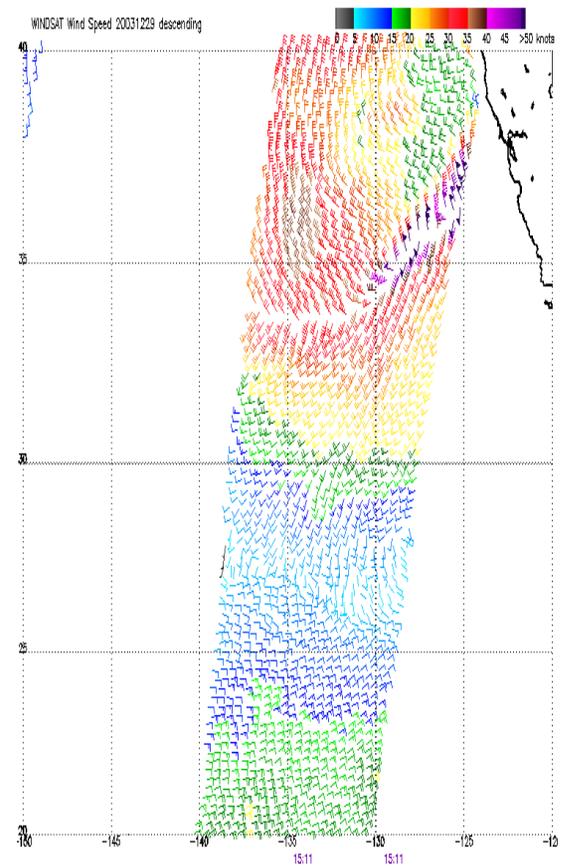
Cloud Liquid Water



Note: 1) Times are GMT 2) Times correspond to 30N at right swath edge - time is right swath for overlapping swaths at 30N
3) Data buffer is 24 hrs for 20031229

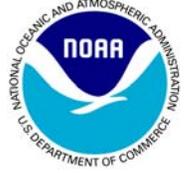
NOAA/NESDIS/Office of Research and Applications

Surface Wind Field



Note: 1) Times are GMT 2) Times correspond to 30N at right swath edge - time is right swath for overlapping swaths at 30N
3) Data buffer is 24 hrs for 20031229

NOAA/NESDIS/Office of Research and Applications



The Future of Environmental Satellites



NPOESS

NPOESS Certified Program



- 2 EMD Satellites plus 2 production
- Bus sized to carry all sensors
- VIIRS, CrIS, ATMS, CERES, OMPS-N, SEM, ADCS, SARSAT remain
- APS, TSIS, OMPS-L, ERBS, Alt, SuS, SESS de-manifested from C1 & C2 [accommodation remains]
- CMIS deleted from C1, MIS planned for C2 and beyond
- Ground architecture essentially unchanged

DAWN

MID-NIGHT

POES N-17
2222 LTAN

MetOp 1
2130 LTAN

DMSP F-3
2013 LTAN

DMSP F-3
1833 LTAN

DUSK

DMSP F-3
1730 LTAN

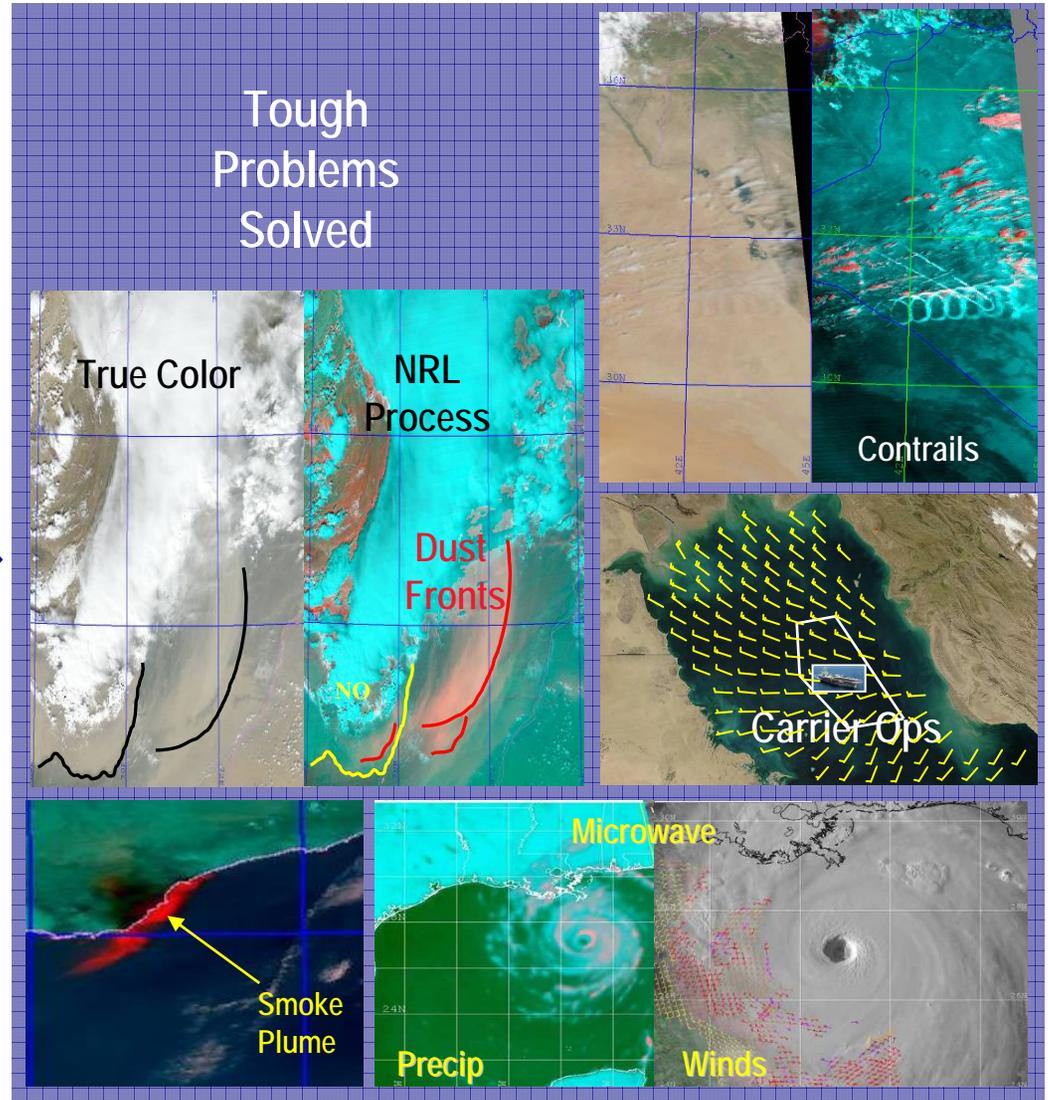
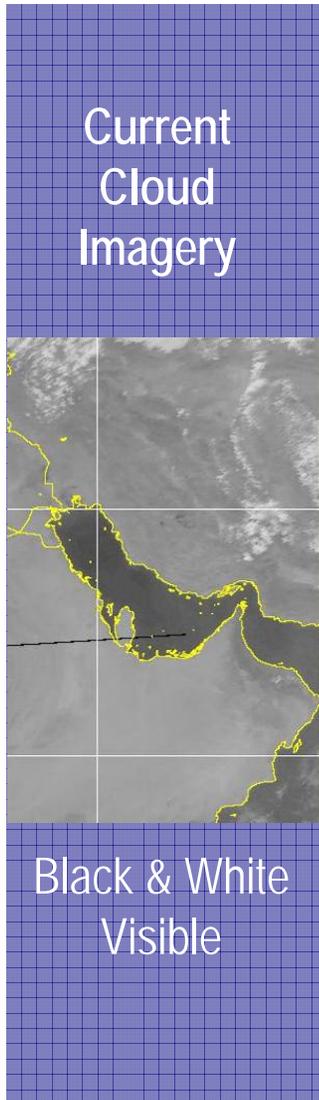
POES N-18

Continuity, Flexibility, Most Capability within budget





Advanced Cloud Imagery Improves Interpretation





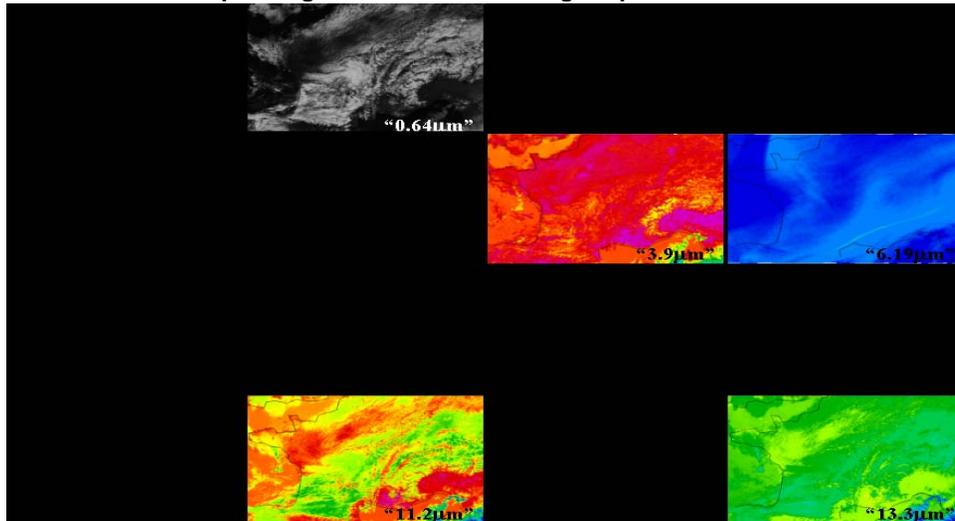
GOES - R



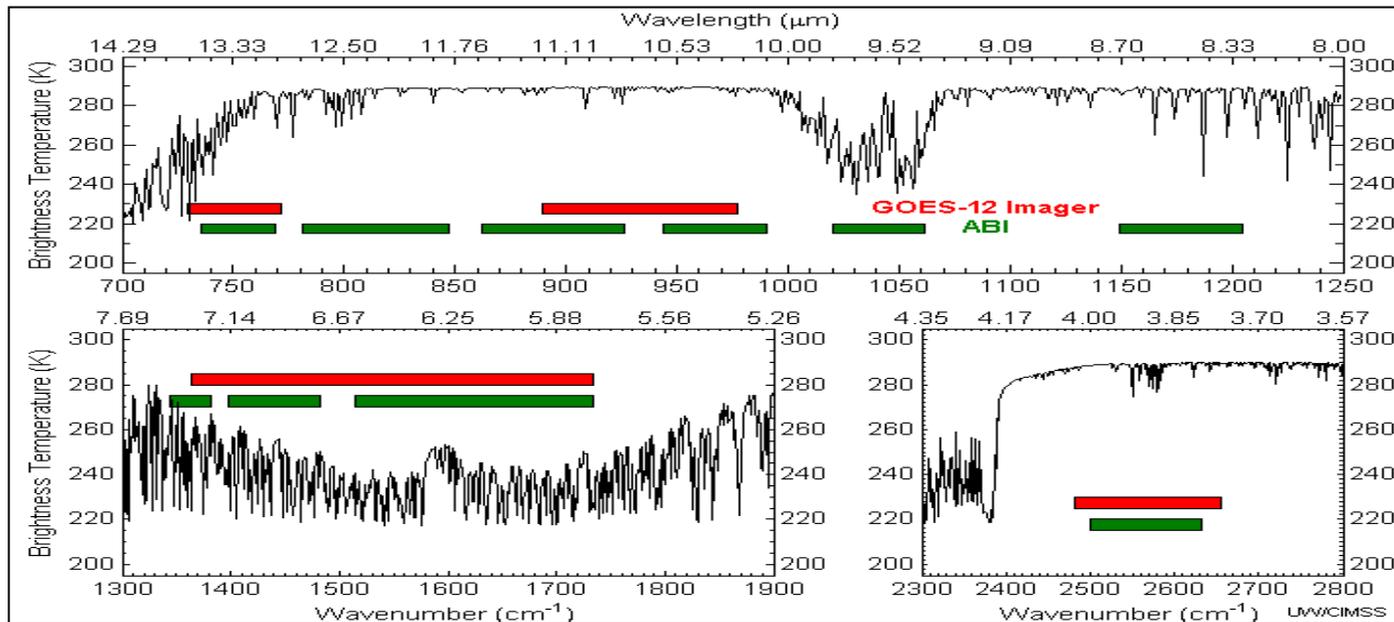
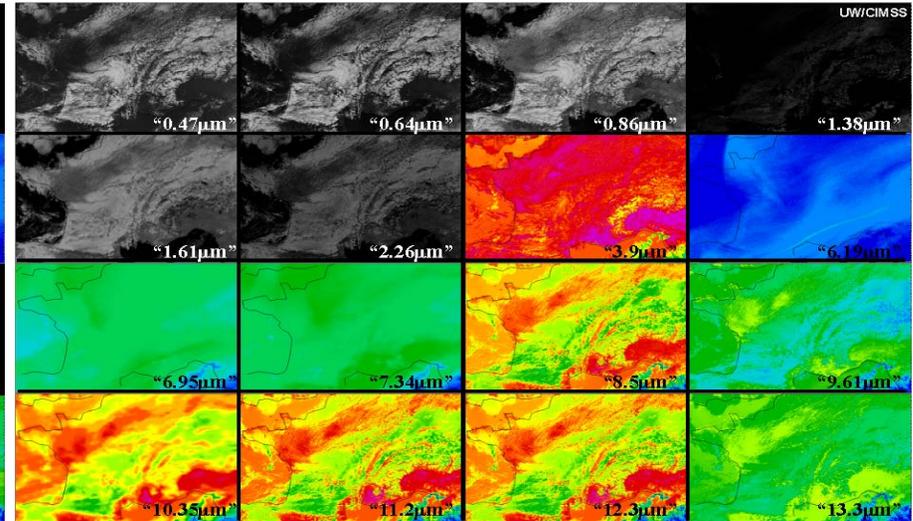
ABI: Improved Resolution . . .



Corresponding Simulated GOES Imager Spectral Bands:



Simulated "ABI" Spectral Bands:



. . . over a wider spectrum



Satellite Training Resources



Training Resources



- National Weather Service
 - NWS Training Center (Kansas City)
 - Forecast Decision Training Branch (Boulder)
 - Warning Decision Training Branch (Norman)
- Cooperative Program for Operational Meteorology, Education, and Training (COMET)
- Virtual Institute for Satellite Integration Training (VISIT) at CIRA/Ft. Collins and CIMSS/Madison supported by both NWS and NESDIS



VISIT Satellite Modules & Teletraining



Sessions are found at:
rammb.cira.colostate.edu/visit/visithome.asp

The screenshot shows the VISIT website interface. At the top, the title "VISIT Virtual Institute for Satellite Integration Training" is displayed. Below the title, a paragraph describes the program as a joint effort involving NOAA-NESDIS Cooperative Institutes, the National Environmental Satellite Data and Information Service (NESDIS), and the National Weather Service (NWS). The primary mission is to accelerate the transfer of research results based on atmospheric remote sensing data into NWS operations using distance education techniques.

On the left side, there is a navigation menu with links for "Training Sessions", "The VISIT Program", "VISIT People", "FAQ", "Links / Tutorials", and "RAMSDIS Online".

The main content area features a "Teletraining Calendar, Signup and Installation" section. Below this, there is a "What's New?" section with links to "VISITview software homepage" and "VISIT / SHyMet new topics survey".

The "Currently Offered Training Sessions sorted by Professional Competency Unit (PCU):" section lists various sessions, including:

- IST PCU 9: AWIPS Multi-source Data Displays
- IST PCU 6: Using Satellite Data and Products
- Satellite Interpretation of Orographic Clouds / Effects
- CRAS Forecast Imagery in AWIPS
- The Enhanced-V: Satellite Severe Storm Signature
- MODIS Products in AWIPS
- Water Vapor Channel Satellite Imagery
- GOES Sounder Data and Products
- GOES RSO Imagery for Severe Weather (RSO 3)
- GOES High Density Winds
- Mesoanalysis RSO
- Forecasting Convective Downbursts
- Cyclogenesis
- TROWAL Identification
- Conditional Climatology AvnFPS 3.2
- NWP PDS: Numerical Weather Prediction
- NAM-WRF Update and Performance Discussion

At the bottom, there is a note: "For a list of all VISIT training sessions, including those not currently offered, go to the Training Sessions page." and a footer: "Last updated by: Dan Bikos February 7, 2007".



COMET Satellite Training Modules

meted.ucar.edu/topics_satellite.php



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Meteorology Education & Training
Operated by the COMET Program
Serving meteorologists since 1989

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topics: satellite meteorology

Satellite Meteorology

Special Interest

NPOESS Userport
This site provides links to information and training on the use of polar-orbiting satellites from NOAA, NASA, and the Department of Defense in addition to previewing features that will be available on NPOESS. Internet discussion groups and listservs are also available on the site. New links and features will be added to the site as new training is developed and more information becomes available.

Outreach Program Report
A COMET Outreach Program partnership between the Florida Institute of Technology (FIT) and the Miami WFO assisted in the acquisition of both diagnostic as well as enhanced prognostic tools that were not previously available to the office. FIT is providing WFO Miami real-time GOES SSTs (GSST) that are being ingested in AWIPS. This represents a significant forecast aid when editing forecast grids over water such as air temperatures, moisture, and wave heights. See the report: [Using GOES SSTs to retrieve over-ocean air temperatures in support of local data assimilation and modeling efforts.](#)

Materials: [Modules](#) | [Translated Modules](#)

Modules

Level	Module Title and Link	Quiz Link
①	Advances in Microwave Remote Sensing: Ocean Wind Speed and Direction description (click to show/hide)	Quiz
①	An Introduction to POES Data and Products description (click to show/hide)	No Quiz
①	An Introduction to the EUMETSAT Polar System description (click to show/hide)	Quiz
②	Blowing Snow: Baker Lake, Nunavut, Canada 04-10 February 2003 description (click to show/hide)	Quiz
②	Determining Visibility description (click to show/hide)	No Quiz
①	Dust Enhancement Techniques Using MODIS and SeaWiFS description (click to show/hide)	Quiz
②	Dynamic Feature Identification: The Satellite Palette description (click to show/hide)	No Quiz
②	Feature Identification Exercises: Clouds, Snow, and Ice Using MODIS description (click to show/hide)	Quiz
②	Feature Identification Using Environmental Satellites description (click to show/hide)	Quiz



Conclusions

- **Access** satellite data – if you don't know it is there, or how to get it, you can't use it
- **Understand** data use – whether by models or direct broadcast satellite data has to fit into the big data picture
- **Prepare** for the future – more effective use today data and education about tomorrow's capabilities will ensure continued outstanding weather support